REMARKS

This amendment is filed in response to the Office action mailed Dec. 11, 2002, in which claims 1-8 are rejected. With this amendment, claims 1, 4 and 7 are amended, and the claims are otherwise unchanged so that claims 1-8 remain in the application.

Attached hereto is a marked-up version of the changes made to the application by this amendment. The attachment is captioned "Version with marking to show changes made."

Rejections under 35 USC §103

At paragraph 2 of the Office action, claims 1-8 are rejected under 35 USC §103 as being unpatentable over "Enhanced accuracy GPS navigation using the interacting multiple model estimator" by Lin et al in view of U.S. Pat. No. 5,592,173 to Lau et al.

With this paper, to distinguish over the combination of Lin et al and Lau et al, method claim 1 is amended by reciting that the step of performing at least a predetermined number of solutions of the state of motion of the receiver is performed at least once during a time in the partial duty cycle when the selected receiver components are powered off; apparatus claim 4 and system claim 7 are amended to include an equivalent recitation, namely that the means recited in the claims for performing at least a predetermined number of solutions of the state of motion of a receiver is operative during a time in a partial duty cycle when selected receiver components are powered of. Claims 1, 4 and 7 are all of the independent claims of the application, and so all of the claims of the application now include a limitation, hereinafter the *computation-in-power-saving-mode* limitation, to the effect that solutions of the state of motion are computed while selected receiver components (having to do with acquiring and down-converting range signals,

components such as the RF front end module and the baseband processor module) are powered off. Neither Lau et al nor Lin et al teach the *computation-in-power-saving-mode* limitation now included in all of the claims of the application.

The Office action concedes at page 3 that Lin et al fails to disclose powering down modules for a period of time, and so relies on Lau et al for such a teaching. Lau et al teaches switching a GPS receiver back and forth between a low power standby mode and a normal mode in order to save power. But instead of teaching the *computation-in-power-saving-mode* limitation of the invention as now claimed in all the claims of the application, Lau et al teaches putting into "quiescent mode" the microprocessor of a GPS receiver used to perform computations on the state of motion of the receiver. At col. 6, lines 47-58, Lau et al discloses,

> The microprocessor is a Motorola CPU32 having in its instruction set a "sleep" instruction that inhibits the microprocessor clock signal by temporarily disabling the clock source or by inhibiting the clock signal. The microprocessor system 40 retains the capability of receiving and processing an interrupt signal when a sleep instruction has been executed even though the microprocessor system is not being driven by a clock signal. In normal mode, circuits in the microprocessor system 40 are driven by the microprocessor clock signal to change digital states. When a sleep instruction is executed, the circuits in the microprocessor system 40 are quiescent. The microprocessor system 40 uses Complementary Metal Oxide Silicon (CMOS) circuits that consume substantially less power when quiescent than when driven by a clock signal to change digital states. The microprocessor system 40 enters low power standby mode when it executes a sleep instruction and enters normal mode when a wakeup interrupt signal is received.

By contrast, as explained at page 8, beginning line 21, the invention is based on periodically shutting down a GPS receiver's low-level hardware used to acquire, track, and process ranging signals from the GPS satellites (including extracting navigation

data and pseudorange information from the ranging signals), and estimating the user's position, velocity and time (PVT) using a motion-modeling filter, such as the Interacting Multiple Models (IMM) filter, to provide PVT solutions both during shut-down and during power-on, which can then provide acceptably accurate PVT solutions even during shut-down. The estimated PVT solutions are used not only for providing continuous position information for the user, but also for speeding up GPS satellite signal reacquisition by using the estimated PVT as the basis for very accurate initial estimates of code and carrier phase. Thus, the invention as now claimed differs significantly from what is taught and suggested by the combination of Lau et al and Lu et al.

Accordingly, applicant respectfully requests that the rejections under 35 USC §103 of claims 1-8 be reconsidered and withdrawn.

CONCLUSION

For all the foregoing reasons it is believed that claims 1-8 are in condition for allowance and their passage to issue is earnestly solicited.

Respectfully submitted,

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James A. Retter
Registration No. 41,266

WARE, FRESSOLA, VAN DER SLUYS
& ADOLPHSON LLP
755 Main Street, P.O. Box 224
Monroe, CT 06468-0224

tel: (203) 261-1234
Cust. No.: 004955

Attorney Docket No.: 944-1.57
Serial No.: 10/016,139

Version With Marking To Show Changes Made

In the claims:

The claims below are amended as follows.

1. (Amended) A method for conserving power in a positioning system receiver used in connection with a positioning system providing ranging signals, the receiver using the ranging signals to determine a state of motion of the receiver, the method comprising:

a) a step (32) of performing at least a predetermined number of solutions of the state of motion of the receiver using a filter solution based on a mix of models of the motion of the receiver, a mix that is varied from one solution to the next according to a predetermined criteria, and of providing the model mix used in each solution; and

b) a step (35) of adopting a partial duty cycle indicating a percentage of time selected receiver components are powered ~~on~~off, the percentage of time based on the mix of models used in successive solutions;

wherein the step (32) of performing at least a predetermined number of solutions of the state of motion of the receiver is performed at least once during a time in the partial duty cycle when the selected receiver components are powered off.

4. (Amended) An apparatus for conserving power in a positioning system receiver used in connection with a positioning system providing ranging signals, the receiver using the ranging signals to determine a state of motion of the receiver, the apparatus comprising:

a) means (15) for performing at least a predetermined number of solutions of the state of motion of the receiver using a filter solution based on a mix of models of the motion of the receiver that are varied from one solution to the next according to a predetermined criteria, and for providing the model mix used in each solution; and

b) means (18) for determining a partial duty cycle indicating a percentage of time selected receiver components are powered ~~on~~off, the percentage of time based on the mix of models used in successive solutions;

wherein the means (32) for performing at least a predetermined number of solutions of the state of motion of the receiver is operative during a time in the partial duty cycle when the selected receiver components are powered off.

7. (Amended) A system, including: a transmitter for transmitting a ranging signal, and a ranging receiver for receiving the ranging signal and for determining a state of motion of the ranging receiver, the ranging receiver characterized in that it includes an apparatus for conserving power that in turn comprises:

a) means (15) for performing at least a predetermined number of solutions of the state of motion of the ranging receiver using a filter solution based on a mix of models of the motion of the ranging receiver that are varied from one solution to the next according to a predetermined criteria, and for providing the model mix used in each solution; and

b) means (18) for determining a partial duty cycle indicating a percentage of time selected ranging receiver components are powered ~~on~~off, the percentage of time based on the mix of models used in successive solutions;

wherein the means (32) for performing at least a predetermined number of solutions of the state of motion of the receiver is operative during a time in the partial duty cycle when the selected receiver components are powered off.